

(a) production

physical

L length/m
 M mass/kg
 T tension/N
 k stiffness/N/m

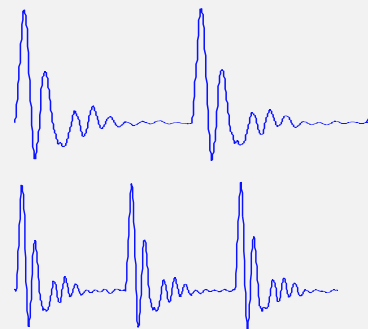
string period

$$p_s \propto L \cdot M/T$$

resonance period

$$p_f \propto L \cdot M/k$$

(b) transmission



time

acoustical

S acoustic-scale
 c speed of sound
 λ wavelength

S_s scale of source

$$\lambda_s \propto p_s \cdot c$$

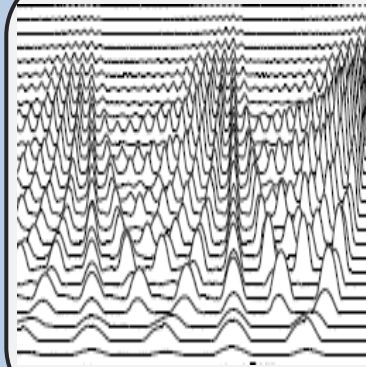
$$S_s \propto \lambda_s / \lambda_{0s}$$

S_f scale of filter

$$\lambda_f \propto p_f \cdot c$$

$$S_f \propto \lambda_f / \lambda_{0f}$$

(c) auditory image



time interval

physiological

x - time interval
 y - tonotopy

NAP period

$$X_s \propto \log_2 \hat{\lambda}_s$$

BM position

$$Y_f \propto \log_2 \hat{\lambda}_f$$

(d) interpretation

perceptual

melodic pitch
 register or size

Chroma, Octave

$$C = L\{m(-X_s) \cdot 12\}$$

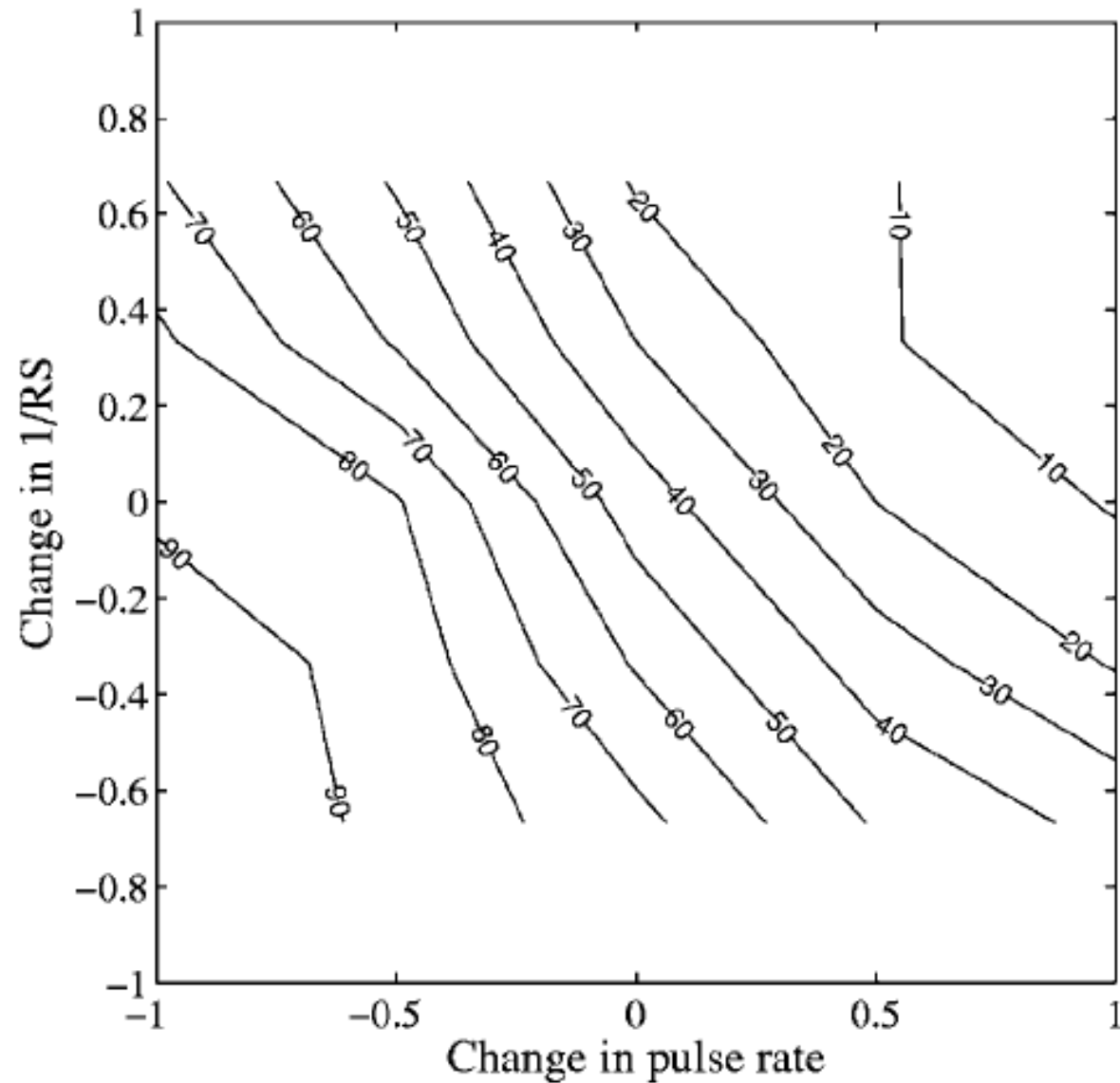
$$O = N\{c(-X_s) - aY_f\}$$

Register, Size

$$R = I\{-X_s - aY_f\}$$

$$S = H\{X_s + aY_f\}$$

Percentage of within-family errors where the listener chose a larger member of the family



Percentage of within-family errors where the listener chose a larger member of the family

